PLASTICS: A Complex Relationship

DRA. EDILENE DE[1] CÁSSIA DUTRA NUNES

5º Congresso Brasileiro do PLÁSTICO™

Realização:

Instituto SustenPlást

Plastic: A Revolution in Human History

"*Plastics, in many forms, contribute positively to society. However, there is a dark side: the way we produce, use, and dispose of plastics pollutes ecosystems, creates risks for human health, and deepens the climate crisis*".

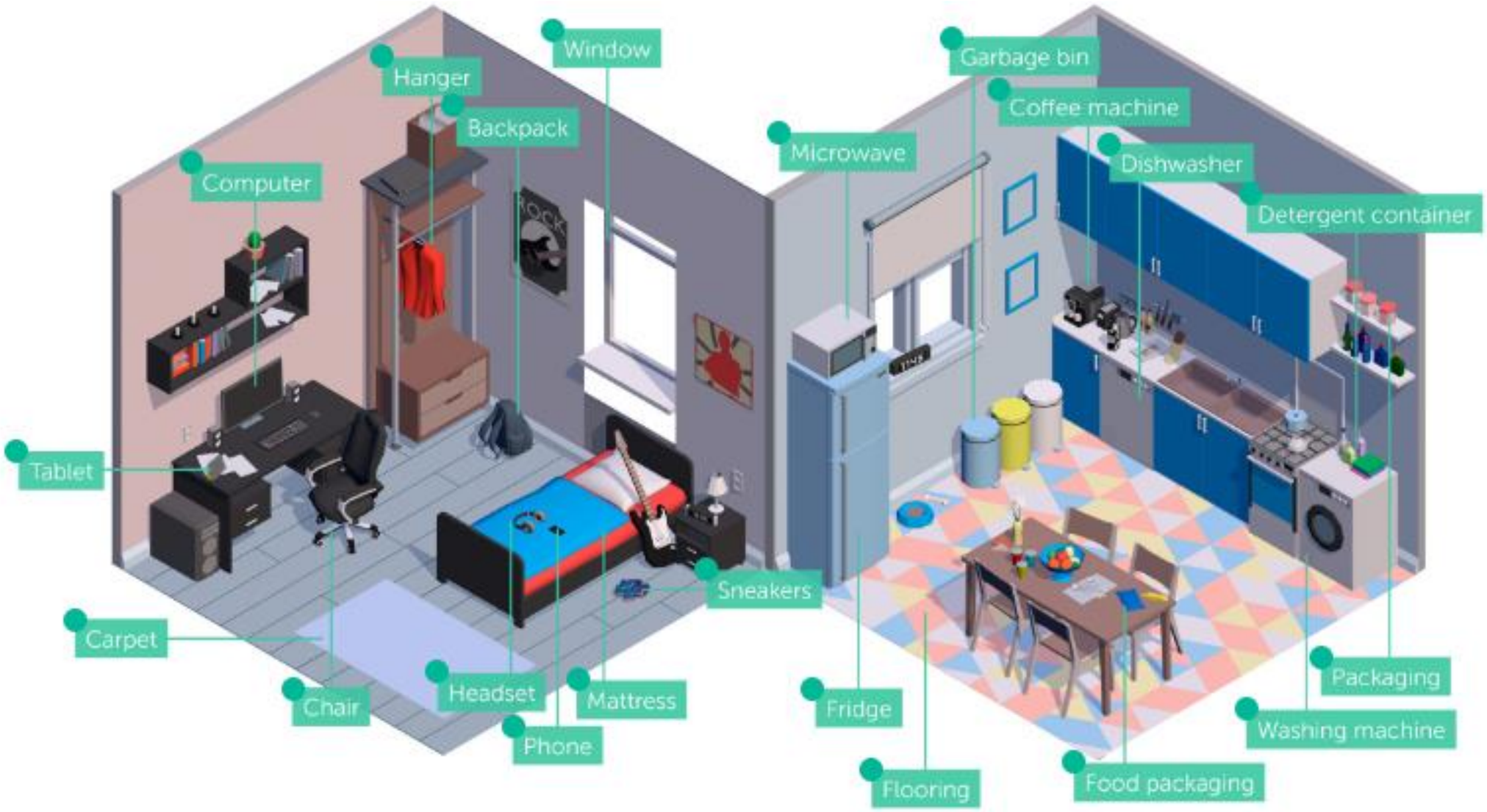
Inger Andersen, Executive Director of Pnuma

Plastic: A Revolution in Human History

Innovation and Versatility:

- Lightweight, durable, and versatile materials with applications in various fields.
- Positive impact in several sectors, such as healthcare, transportation, agriculture, and industry.

Plastic: A Revolution in Human History



Benefits of Plastics in Everyday Life

Packaging:

- Protection and preservation of food, medicine, and other products;
- Reduction of waste and extension of product shelf life.

Healthcare:

- Essential medical equipment (syringes, catheters, prosthetics);
- Advances in healthcare, such as surgical techniques and drug development.

Automotive:

- Lightweight materials, contributing to energy efficiency and emission reduction;
- Enhanced design and safety.

Construction:

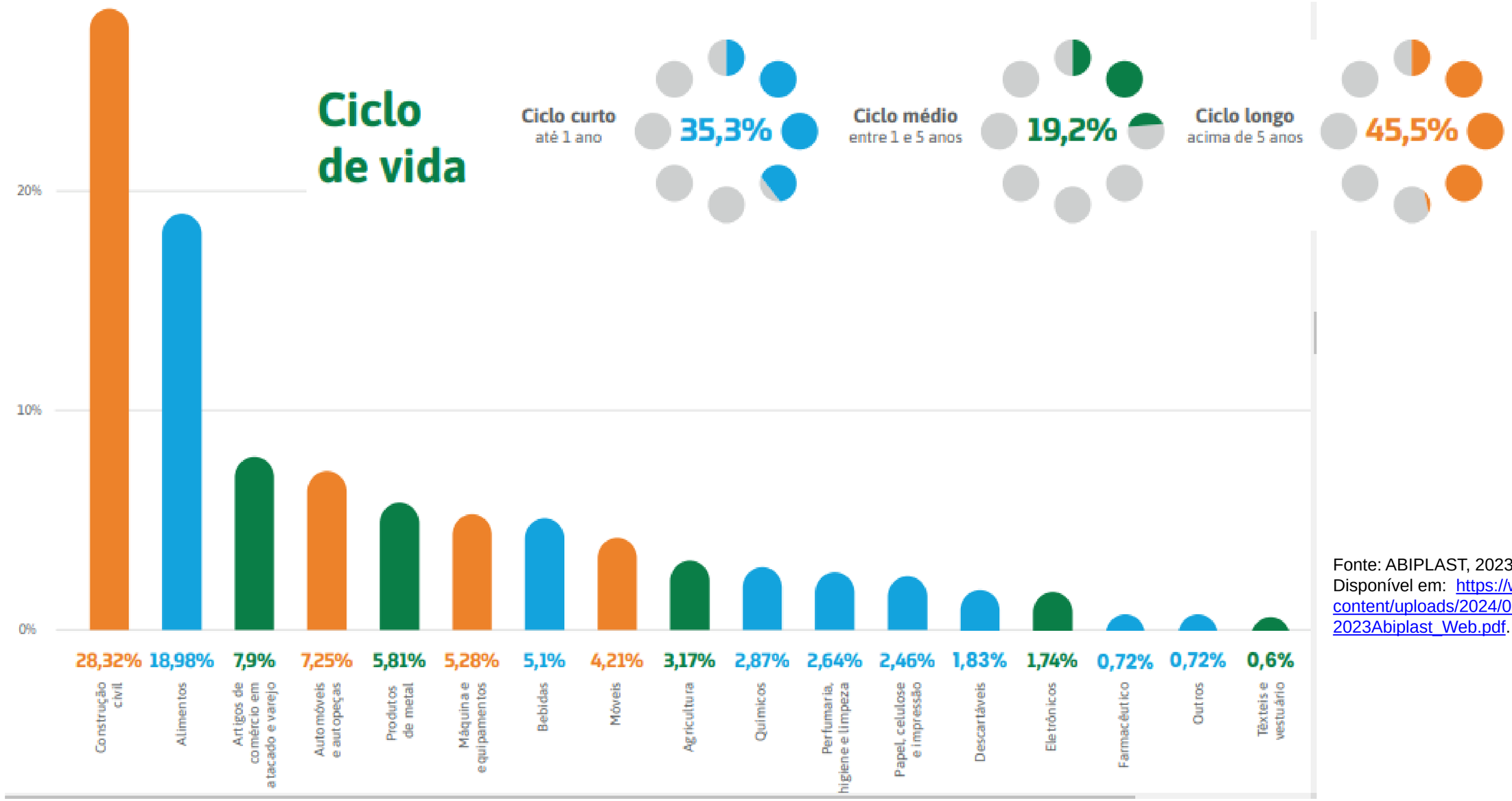
- Thermal and acoustic insulation, reduced costs, and construction time.

Benefits of Plastics in Everyday Life

Plastic Industry

Fonte: ABIPLAST, 2023.**Preview Perfil 2023**. Disponível em: https://www.abiplast.org.br/wp-content/uploads/2024/08/Preview-2023Abiplast_Web.pdf. Acesso em: 10 ago. 2024.

Sectors Consuming Plastic Products – by Consumption Value



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Microplastics

“Plastics - Environmental Aspects - State of Knowledge and Methodologies”(ISO/TR 21960:2020):

- Any plastic solid particle insoluble in water with **dimensions between 1 µm and 1000 µm.**
- Term "large microplastic” for the size range of 1 to 5 mm.

Fonte: SOBRAL, P. **O mundo está cada vez mais contaminado por plásticos. 2018.** Disponível em: https://www.rtp.pt/noticias/mundo/o-mundo-esta-cada-vez-mais-contaminado-por-plasticos_n841198. Acesso em: 10 ago. 2024.

Microplastics

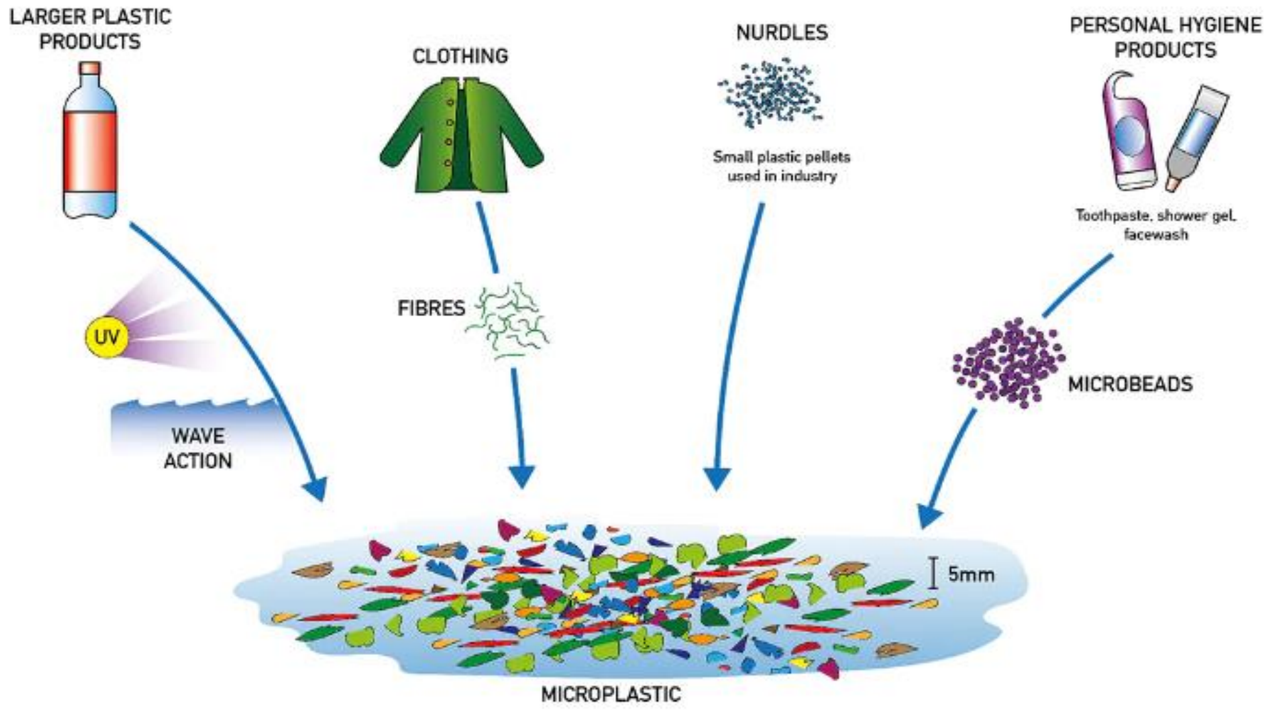
- **Primary source** are those produced purposely to be used on a scale of up to 5 mm, and consequently are released into the environment in this size. These can be presented on a microscopic scale (microspheres):
  - **Cosmetic formulation** (glitter) and personal hygiene products (PHP) are used in different ways such as: facial and body scrubs, soaps and toothpastes, detergents for clothes, eye shadow, ambient odorizers, deodorants, shampoos, conditioners, soaps, liquid soaps, lipsticks, hair dyes, moisturizers, sprays for hair, face masks, baby care products, eye shadows, mascara, among others.
- **Secondary source:** are those that result from the fragmentation of larger plastic waste (ex: packaging) exposed to the elements in the environment and other stressors, degrading into smaller and smaller fragments until reaching the MP size.

Microplastics

Fonte: VARGAS et al. **Microplásticos**: uso na indústria cosmética e impactos no ambiente aquático. Disponível em: https://www.scielo.br/j/qn/a/sr67Byx5TJHdDvdPzV8SRJd/?format=pdf&lang=pt. Acesso em: 10 ago. 2024.

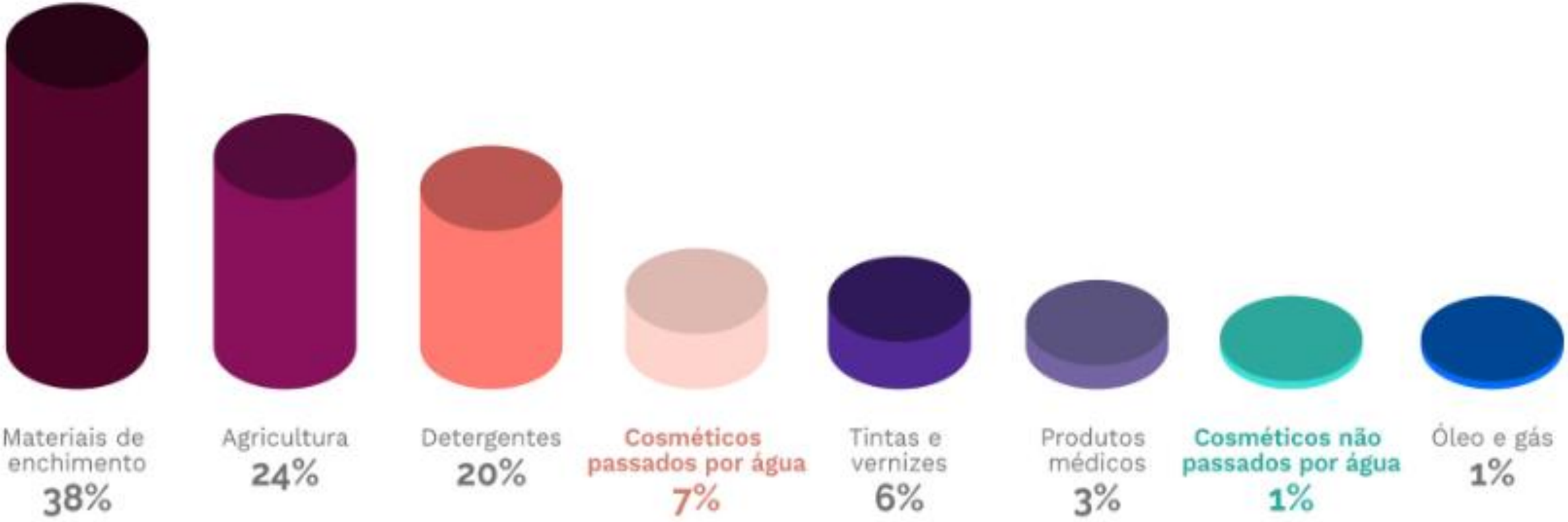
Microplastics

Fonte: IBERDROLA. **O que são Microplásticos** Como os microplásticos nos afetam? 2019. Disponível em: https://www.iberdrola.com/meio-ambiente/microplasticos-ameaca-a-saúde. Acesso em: 10 ago. 2024.



Fonte: INSTITUTO OCEANOGRÁFICO. **XXXV. Microplásticos no ambiente antártico.** Disponível em: https://www.io.usp.br/index.php/oceanos/textos/antartida/1315-xxxv-microplasticos-no-ambiente-antartico.html. Acesso em: 10 ago. 2024.

Microplastic debris found in the environment: European Union.

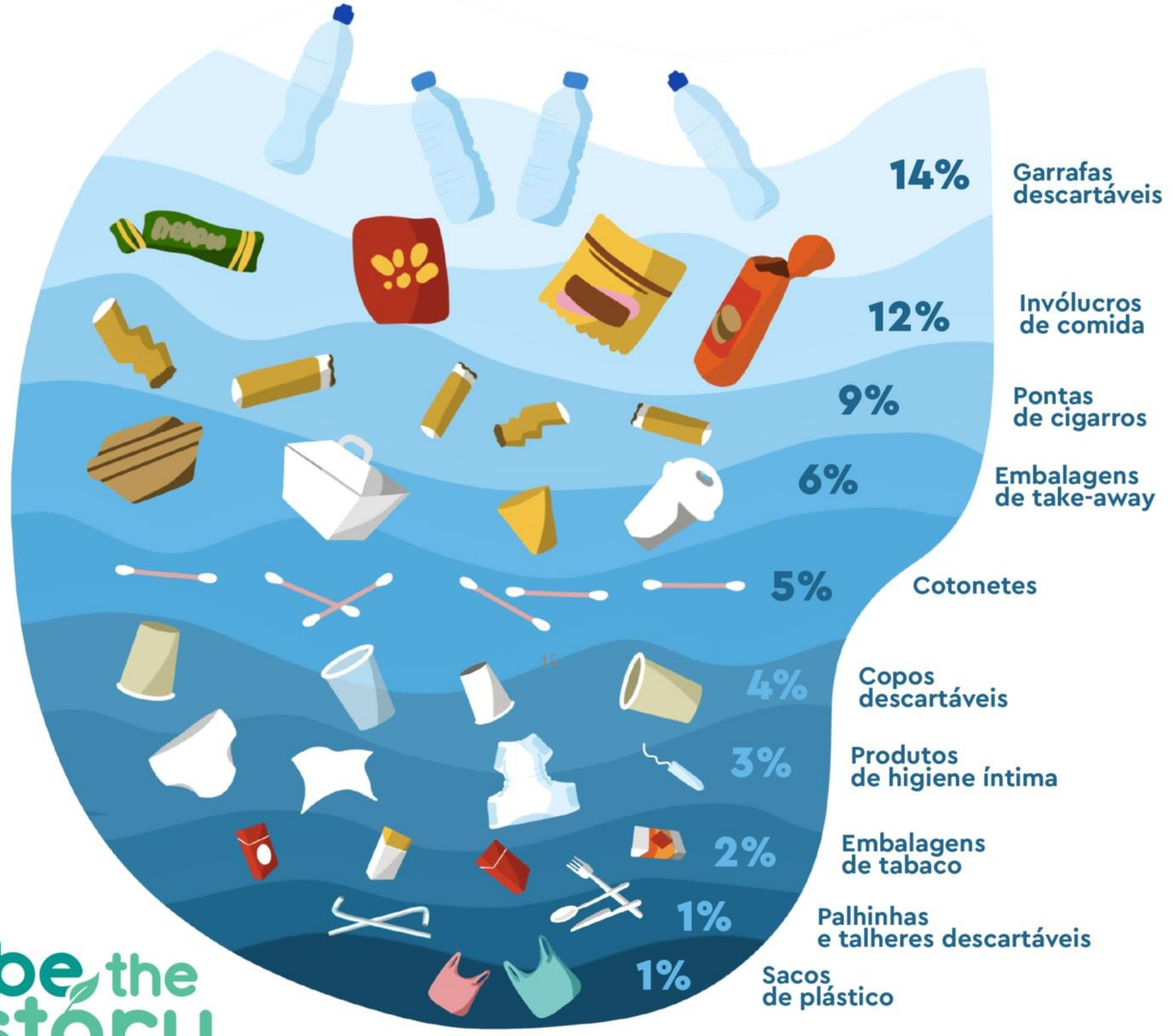


Fonte: L'OREAL. **Microplásticos nos produtos cosméticos, vamos decifrar o tema juntos!** Disponível em: https://por-dentro-dos-nossos-produtos.loreal.pt/a-nossa-abordagem/microplasticos-nos-produtos-cosmeticos-vamos-decifrar-o-tema-juntos. Acesso em: 11 ago. 2024.

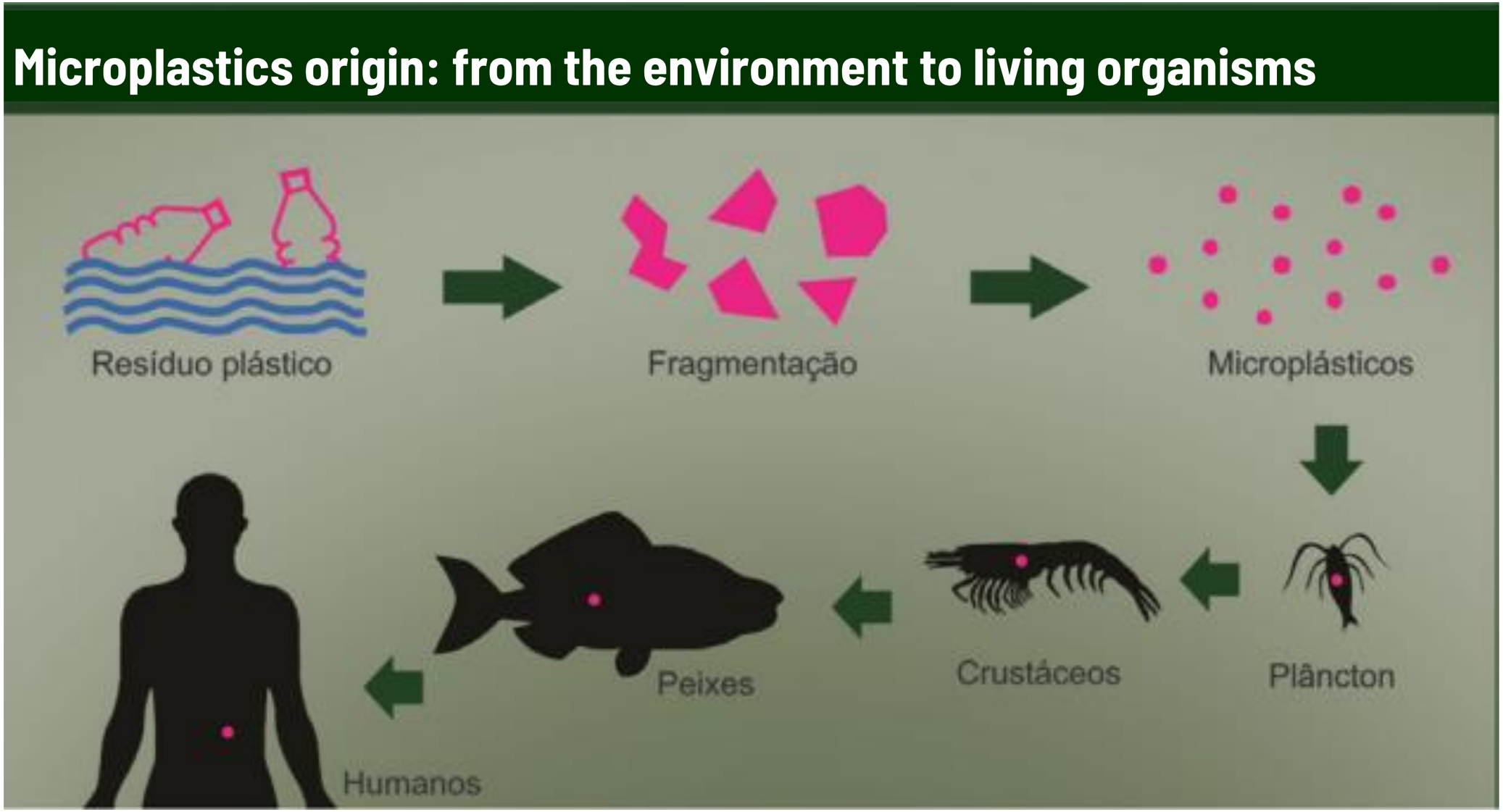
Microplastics

- This type of polymers (particles, fibers, etc. smaller than 5 mm) **cannot be removed by processes** used in wastewater treatment plants.
- These **particles pass through the entire wastewater treatment process**, and thus reach the oceans and other aquatic bodies.
- Plastic fragments and the substances that make up these materials (via absorption/adsorption) can be ingested and accumulated by aquatic organisms, contaminating the entire biological chain.
- The ecological impacts are still being investigated and discussed.

Microplastics



Microplastics



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Microplastics

Implications of microplastics as pollutants in the environment:

- The literature reports the **ability of plastics to adsorb/transport toxic substances**, persistent and bioaccumulative, present in small quantities in aquatic environments.

Plastics

- Despite being considered the "number one enemy of the environment," plastic and **its applications are essential in today's world** – from medicine to science.
- For example, plastics used in high technology, such as PEEK (polyetheretherketone), are used to create medical devices or spare parts, even to recreate skulls in neurosurgery.
- At the same time, plastics enable a more effective way to protect and preserve food, extend its shelf life and even contribute to the fight against carbon emissions associated with the distribution of products.

Challenges and Solutions for a Sustainable Future

- **The problem is not necessarily in the use of plastics, but rather in how they are discarded**.
- The amount of material that enters the waste management system can be reduced by actions that reduce the use of plastics in products (for example, substitution of heavier packaging formats by lighter ones)
- Designing products to enable reuse, repair or remanufacturing will result in fewer products ending up in the waste stream.
- The reuse of plastics used for transportation and goods, such as vehicles and electronic equipment, is also evident on an industrial scale with the reuse of containers and pallets in transportation.

Challenges and Solutions for a Sustainable Future

Waste Management:

- Selective collection, recycling and composting of plastics;
- Investment in innovative technologies for treatment and reuse

- **Biodegradable and Compostable Plastics:**
  Development of environmentally sound alternatives

Plastic Recycling Industry

Índice de recuperação de plásticos:
30,1%

Índice de reciclagem mecânica:
25,6%

Índice de reciclagem de plástico pós-consumo, por material:

PET	EPS	PEAD
53,6%	33,8%	31,2%
PP	**PVC**	**PS**
23,8%	16,8%	11,5%
XPS	**PEBD/L**	**Outros[2]**
8,9%	11,6%	24,9%

Fonte: ABIPLAST, 2023.**Preview Perfil 2023**. Disponível em: https://www.abiplast.org.br/wp-content/uploads/2024/08/Preview-2023Abiplast_Web.pdf. Acesso em: 10 ago. 2024.

Plastic Recycling Industry

Das 1,5 milhão de toneladas de resíduo plástico consumidas na reciclagem:

1 milhão de toneladas são de plástico pós-consumo

Material descartado em domicílios e em locais como shoppings, estabelecimentos comerciais, escritórios, etc.

405 mil toneladas de plástico pós-industrial

Sobras dos processos da indústria petroquímica, de transformação de plásticos e da própria reciclagem.

SOBRE EMPRESAS

677 empresas

AUMENTO DE 2,4%

em relação a 2020

SOBRE EMPREGOS

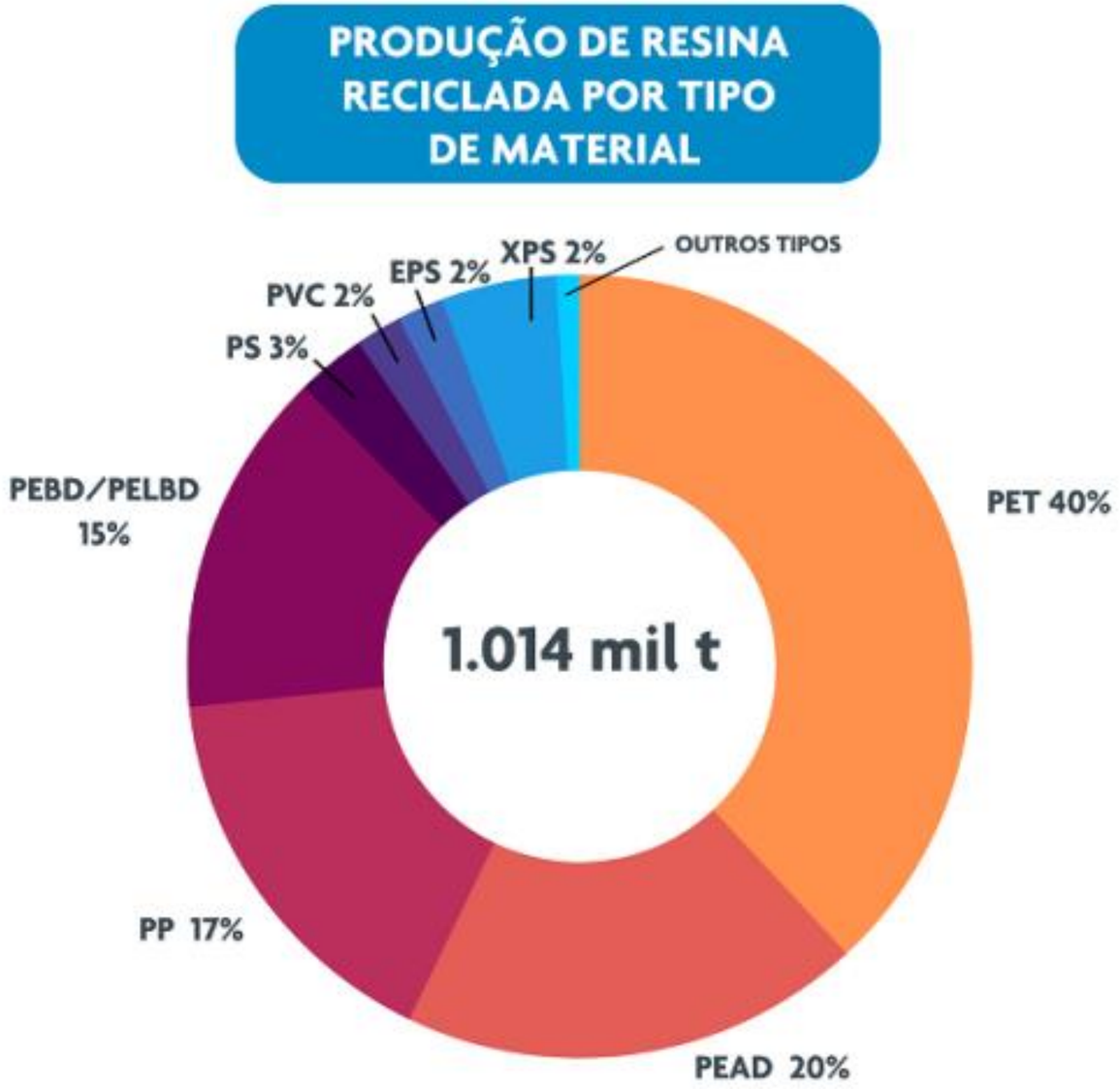
16.883 empregos

AUMENTO DE 6,3%

em relação a 2020

Fonte: ABIPLAST.4ªPesquisa anual de índice de reciclagem no Brasil. 2022. Disponível em: https://www.abiplast.org.br/wp-content/uploads/2023/01/pesquisa-links.pdf. Acesso em: 10 ago. 2024.

Plastic Recycling Industry



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Awareness and Shared Responsibility

Education and awareness:

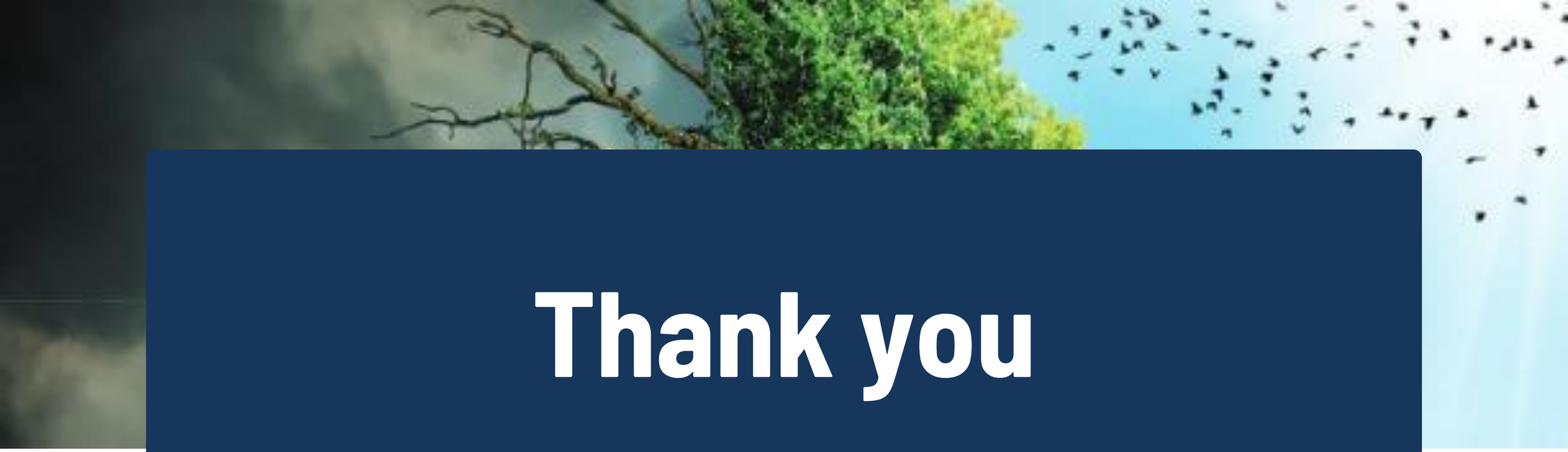
- Importance of proper disposal of plastics;
- Incentivize conscious consumption and the search for sustainable alternatives.

Industry Commitment:

- Development of more sustainable products and packaging;
- Reduction of single-use plastic production.

Conclusion

- Plastic is a fundamental material for modern society, with undeniable benefits.
- However, improper disposal and the production of single-use plastics represent a major threat to the environment.
- The search for innovative solutions and the commitment of everyone are essential to building a more sustainable future.



Thank you

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